

Highlights of the Herbert Hoover Dike Consensus Report Media Roundtable, Nov. 2, 2007

Background:

The U.S. Army Corps of Engineers (USACE) in 2005, 2006 and 2007 performed a Screening Portfolio Risk Assessment that considered performance and consequence of failure to prioritize 30 percent, or 202 of USACE-owned and operated dams nationwide that were perceived to be the highest risk. The assessment process produced a relative life and economic risk used to prioritize flood damage reduction projects nationwide. The Corps identified six Dam Safety Action Classification I projects, including the Herbert Hoover Dike.

The Corps' findings and recommendations for the projects undergo review by an independent external peer review panel. The first report finalized was Wolf Creek Dam, followed by Center Hill Dam, and on Nov. 2, 2007, the Corps released the Herbert Hoover Dike report.

The external peer review panel provides additional insight to assist the Corps with its dam safety management and programming decisions. It also supports an important Corps' Action for Change to employ dynamic, independent reviews of projects with potential of high consequences. The external panel validates the high-risk classification and interim risk reduction measures and provides important input regarding current efforts to investigate, monitor and modify these Corps projects.

Dr. Donald Bruce spoke on behalf of the engineer panel and made these introductory points to a roundtable of national and local media Nov. 2, 2007:

- We concur the Dam Safety Classification One, Urgent and Compelling is appropriate for the Herbert Hoover Dike.
- Piping – the movement of material carried by seepage – we believe has initiated at several discrete locations around the dike. However, the rate in which this piping occurs appears to be very dependent on the lake level. Historical observations point to an increase in level of piping activity when the lake rises above about 17 feet for any prolonged period.
- Other analytical studies conclude that failure of part of the dike would occur at certain locations with sustained lake elevations above 21.5 feet, calculated as a 1 in 100-year occurrence. This is true unless the rehabilitation is conducted in these areas.
- Herbert Hoover is a unique structure within the Corps' portfolio – how it was built in the 1930s and the size of the dike itself. The strategy for its rehabilitation must follow a worst-case, first-logic. Now this will be determined by the risk-analysis which we have recommended that the corps conduct and which we understand has been conducted so far. We would like to see the rehabilitation started on the most critical reaches as soon as possible.
- The panel supports the general design principles of the currently proposed rehabilitation. The principle feature is a partial cutoff wall through the dike, which penetrates into to the foundation rock. The purpose of this cutoff will be mainly to prevent piping. The other

main element is the building of a seepage berm on the downstream face of the dike to intercept and collect any seepage which makes its way through the foundation.

- The panel remains very impressed with the current surveillance and monitoring program that the Corps is conducting on the dike. We fully support their plan to introduce automation to facilitate real-time remote monitoring.
- The panel has made a number of recommendations regarding further engineering and hydraulic studies, which would benefit the project. None of these studies, however, should be permitted to detract from the current prioritized plans, which the Corps has for the remediation of the project. We observed that this whole project is in a fast-track situation with a lot of parallel tasks and this reflects the degree of concern that we all share about the ongoing safety of this unique structure.

Media Questions and Panel or Corps Responses

This sounds like it reiterates the other reports that were done. Do the studies done in the past and now this report bring a new sense of urgency to repair the dike?

Dr. Bruce: We were extremely impressed with the volume of information that currently exists and we were, therefore, a little limited in any originality from our point. We were just standing back and exerting a little engineering judgment over the whole thing. With respect to the pace at which the work is done, it really is quite extraordinary as well. There are parallel tracks, and they all seem to be fast-tracks. We see nothing in any way that would suggest the current pace be slowed down, quite the contrary.

Corps: The current project cost is \$856 million and the schedule takes us out until 2030. However, with any major construction project, you have an 'S'-curve. The first part of the project you have a ramp-up period and then the construction curve gets really steep and at the end it kind of flattens back out. Right now, we're in the ramp-up period. For this year, we have about \$56 million, and for fiscal year 2009 we have about \$78 million for construction. After that, we will have the capacity to place more, probably in the neighborhood of \$140 to \$150 million a year. So, the schedule can be speeded up. That is totally up to the Congress. Everybody in the Florida delegation seems to be very interested in increasing the pace, but again, that's entirely up to the Congress.

(Not said during the interview, but in addition, the Corps has prioritized and budgeted more funding for HHD in each of the next two years than any single dam safety construction project within the agency's budget.)

Given the completion date of 2030, what's in place now should a 100-year event occur within the next five years?

Corps: We're looking at the worst areas first to repair. Most of our studies pointed to the toe ditch and we have already begun filling the worst places, that's underway. You're right, the 100-year flood could happen tomorrow afternoon, and we've already taken some risk reduction measures. We have rocks stockpiled all around the dike to facilitate emergency repairs; a repair plan in place; we have worked really closely with emergency management officials; we're looking to lower the lake via a new regulation schedule; and, we also beefed-up our monitoring and inspection schedule so anytime the lake gets to 16.5 we do daily inspections. That's live people on the ground – people that have worked on the dike for 20

years a lot of them. We know where the problem areas are so obviously we look at them first, but we also look at the whole dike. We're doing everything we can to mitigate risk.

With the 6 to 1 ratio of inflow to outflow, what is the status of the emergency spillway concept?

Corps: That is something we're looking at in the Major Rehabilitation Report on Reaches 2 and 3. The spillway is one of the options we're looking at among other options to mitigate the risk. There is a structural limitation for outflow – and we're looking at all the options we might employ to mitigate this.

Dr. Bruce: We haven't done any independent studies, but clearly there is concern on the ability of the lake managers to take the water down quickly given the current situation we have there. You have to go into some pretty extensive studies to find out what damage potential the released waters might have down stream. I'm sure that's something that the Jacksonville District is looking at. It's a concern and a major limitation on the ability to control the lake waters.

Corps: When we do the Major Rehabilitation Report draft, we will have an independent technical review of that report as well.

What's the update on the more specific design plans – what lands will you need to create the berm and do what you need to do?

Corps: Those designs are currently underway. We're shooting to have the designs for Reach 1A (between Sandcut and Port Mayaca) and 1D (south of Pahokee) close enough so we can have a footprint in January. The other two reaches, B and C, we'll have those designs done in the spring. Having said that, we have already identified some locations – places that we know are critical areas – we have already identified them for purchase to our partner, the South Florida Water Management District. We are in the process of giving them surveys and they can start with the acquisitions (process) as soon as we get the surveys done in the next couple of weeks.

How do you work around so many existing homes and structures already in this area?

Corps: We're looking at a whole suite of solutions and they all can help, but keep in mind that our number one priority is public safety. If there is a solution that still meets the engineering criteria, it reduces the risk in accordance with the criteria, then we will use those solutions to cause the least impact to homes (and facilities) around the lake.

Can you explain the difference between a spillway and a flow-way?

Corps: A spillway is a typical feature of a dam. It provides a level of protection so the dam's structural capability to hold a pool is not exceeded. It's typically placed at a relatively high elevation in the structure and functions only in an emergency situation. It doesn't provide any ecological benefits like a flow-way might; it's built as an emergency feature.

Will this report change the new regulation schedule and the decision on how water is released from the lake?

Corps: This specific report does not have any direct affect on the regulation schedule we have today, nor does it have any impact on the report that's currently being put forth for public and agency review. However, the report does provide support for some for the current

goals of the new Lake Okeechobee Regulation Schedule, that being balancing the lake and estuary ecology, and still provide the public safety for flood protection / flood control, as well as other benefits associated with inland navigation, recreation and water supply.

Dr. Bruce: We, as a panel, are in complete agreement with that statement. We were not actually required to look at that as a specific item. I think in the course of our historical review, and then our understanding of the different events that occurred around the lake, we were very much of the opinion that the problem could be mitigated with the lake lowered down as described as part of the regulation scheme. Our findings are completely consistent with them.

Will the cap be dropped down from the proposed lake regulation schedule of 17.25 to no higher than 17 feet?

Dr. Bruce: Frankly, I don't believe a three-inch difference is going to make a super difference in the stability or the safety of the structure. It's not the embankment taking sustained loading for a short period – a couple of days or maybe a week – it takes time to cause the problem. If the 17 or 17.25 feet was exceeded for a short period, I think that's quite acceptable.

Corps: The elevation of 17.33 in the (proposed 2007) Lake Okeechobee Regulation Schedule is actually a one-day maximum peak over historical period of record of 36 years. What that basically tells you is that it's a flashy, instantaneous peak not to be experienced over a long period of time.

Can you sum up this report in one or two sentences, and emphasize the key points?

Dr. Bruce: We were extremely impressed with the level of understanding of the performance of this structure and the implications if the lake were to come up and another event were to happen. We were very impressed that people were on the ball here. Secondly, the level of surveillance and maintenance that has been conducted on this structure is exceptional, and as have you the intensity of that surveillance varies in response to the height of the lake and that's very important. This is not by the numbers, it's doing it in response to what's actually happening in the field. Thirdly, over the years there have been different engineering approaches or concepts on how to fix this problem. Again, we're very pleased a very responsive and sensible remediation has been put in place. We like that very much. And that is a reflection of people's openness, frankly, to accept the input from outside parties as well as from specialists within the Corps. The list of people who have been involved in this problem is like an engineering Who's Who. The other point I want to make is the construction technologies that are now being considered to create the partial cutoff (wall) are themselves very interesting and reflect international expertise.

Who makes up peer review?

Corps: The external peer review panel consists of international engineering and science experts, all from organizations external to the federal government:

Steve Poulos, P.E., PhD, Chair

- ✦ Preeminent Geotechnical Engineer
- ✦ Founding member of Geotechnical Engineers, Inc. of Cambridge Massachusetts
- ✦ Former student of Dr. Cassagrande, and engineering professor at Harvard University

Keith Ferguson, P.E., Vice Chair

- National Water Resources Program Director and Geotechnical Engineer, Kleinfelder A/E firm

Jeff Bradley, P.E., D.WRE, PhD

- Senior Hydrologic and Hydraulic Engineer, WEST Consultants

Donald Bruce, C. Eng., PhD

- President, Geosystems, L.P.
- Licensed professional in geology, geotechnical engineering, and engineering geology
- Grouting, foundation remediation, and construction technology expert

James Talbot, P.E.

- Private Geotechnical Engineering Consultant with international expertise in filter design
- Former agency-wide Senior Geotechnical Engineer with Soil Conservation Service (NRCS)

John Vrymoed, P.E.

- Senior Dam Safety Engineer with California Safe Dams Program, California
- Represents both dam ownership and dam safety regulatory perspectives